

# Environmental Practices for Biomedical Research Facilities

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As a result of the Leadership Conference on Biomedical Research and the Environment, the Facilities Committee focused its work on the development of best environmental practices at biomedical research facilities at the university and independent research facility level as well as consideration of potential involvement of for-profit companies and government agencies. The designation "facilities" includes all related buildings and grounds, "green auditing" of buildings and programs, purchasing of furnishings and sources, energy efficiency, and engineering services (lighting, heating, air conditioning), among other activities. The committee made a number of recommendations, including development of a national council for environmental stewardship in biomedical research, development of a system of green auditing of such research facilities, and creation of programs for sustainable building and use. In addition, the committee recommended extension of education and training programs for environmental stewardship, in cooperation with facilities managers, for all research administrators and researchers. These programs would focus especially on graduate fellows and other students, as well as on science labs at levels K-12. *Key words:* air conditioning, biomedical research, building decommissioning, energy efficiency, engineering services, environmental stewardship, green auditing, heating, lighting, National Council for Environmental Stewardship in Biomedical Research. — *Environ Health Perspect* 108(suppl 6):945-948 (2000). <http://ehpnet1.niehs.nih.gov/docs/2000/suppl-6/945-948medlin/abstract.html>

Of all the opportunities to develop environmental stewardship in biomedical research, perhaps none could have as much impact as those in facilities management. This field encompasses planning, design, and construction (or rehabilitation); environmental auditing; energy efficiency; engineering services (heating, ventilation, air conditioning and lighting, among others); custodial and landscape services; financial planning and human resources activity related to facilities and building decommissioning; and ensuring that facilities themselves are healthy for the occupants.

The Environmental Practices for Biomedical Research Committee of the Leadership Conference on Biomedical Research and the Environment examined all these areas and concluded that an excellent opportunity exists to develop a national program of facilities environmental stewardship, including education and training programs at the campus, regional, and national levels, and to unite the efforts of many organizations in the process.

Over \$17 billion for maintenance and operation of higher education facilities and \$18 billion for planning, design, and construction of facilities is spent annually in the United States, or about 20% of the entire U.S. higher education budget (1). Much of that expenditure is for facilities for hospitals, medical schools, and research facilities—all of which are changing rapidly to deal with new economic paradigms and technological improvements. Education and training programs must be developed that permit appropriate changes to be made with environmental

stewardship in mind, especially considering Federal expenditures for biomedical research are increasing rapidly.

The committee also noted other science facilities (public and private K-12 schools and districts) that should be considered part of the research education and training initiative.

The research administrators, teachers, and facilities administrators who work in such laboratories represent a multibillion dollar market for products and services. A concerted effort by purchasing agents for research facilities to request suppliers to make available environmentally sound and energy-efficient products and to request information about environmental activities at suppliers' facilities, including results of their "green audits," could extend the influence of stewardship in facilities.

The committee examined the issue of facilities allied with the research enterprise, such as schools of nursing, dentistry, and veterinary medicine, and related facilities such as dormitories and medical science museums. These organizations could also collaborate in environmental stewardship, as they are all involved in or related to research.

The concept of an overall coalition with all health provider organizations should be considered number one.

## Organizational Assets

The committee considered the organizational assets available for an education and information effort.

The conference itself, with its co-conveners, 5 sponsors, 57 co-sponsoring organizations,

and over 300 participants, as well as 30 presenters and 100 professionals working on committees, indicates the depth of interest in the issue. The committee considered that if a wide-ranging environmental stewardship program were developed, those present at and supporting the conference should be contacted first to request their involvement. It was suggested that the National Association of Physicians for the Environment might be willing to take on this task.

It was noted that an organization of professionals in the facilities field already exists. The Association of Higher Education Facilities Officers (APPA) has a membership of nearly 4,500 facilities professionals (some in countries outside the United States, such as Mexico and Canada) responsible for the infrastructure (buildings, campus, grounds) of educational facilities. The association has worked on environmental issues in the past, including energy efficiency, and has placed environmental stewardship as one of its highest priorities. The association has structured local, regional, and national education and training programs that could be adapted to environmental stewardship issues in research facilities. Many APPA members have for a long time been active on these matters.

The U.S. Environmental Protection Agency (EPA), which sponsored Laboratories 21 (2), a program for the greening of Federal scientific laboratories, could add considerably to the effort. Hospitals for a Healthy Environment, a program of the American Hospital Association, developed after a Memorandum of Agreement with EPA (3), has already produced draft best practices guidelines on water disposal, incineration, mercury-free facilities, and others.

The Howard Hughes Medical Institute, which has more than 3,000 researchers working in many research labs across the country, has also begun a program of environmental stewardship, has held several workshops, and

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is developing materials and recommendations for its grantees.

The National Institute of Environmental Health Sciences has taken a leadership role as well, not only in helping to fund the conference but also in committee leadership and other conference activity, and is now developing an ongoing role for institutional environmentally sound practices.

The National Wildlife Federation has for many years worked to improve environmental activities in educational facilities, particularly on university campuses, working with cadres of students there.

Regions 4 and 5 of EPA have agreed to provide the electronic platform and staff for future information programs for the field. This committee believes that such support would be invaluable for the electronic distribution of developed information.

The concept of green auditing is increasingly being used at the higher education level. The committee regards the green audit to be vital to the effort and regards this as a significant priority.

However, the committee learned that the work of decommissioning research laboratories is now frequently haphazard. The need for more or less space is a common research laboratory problem, and options include renovating existing space, leaving or demolishing old space, and acquiring new space or property for building. Regardless of the solution, previously used space must be decommissioned in an environmentally safe manner and be made safe for future use. Risks remaining after use may include asbestos, underground storage tanks, and lead paint, or hazards from research activities (e.g., radioactive, microbiological, or chemical contamination). Specific standards must be developed for management and cleanup of facilities.

A number of electronic software and printed materials are becoming increasingly available to the facilities sector. For example, the identification of environmentally and economically balanced building products is difficult. The committee considered the National Institute of Standards and Technology Green Buildings Program, which began the Building for Environmental and Economic Sustainability project in 1995, to facilitate the identification process (4). The software tool is based on consensus standards and is designed to be practical, flexible, and transparent.

During committee deliberations it was suggested that perhaps a model already exists for developing economically sound goods and services in the biomedical research sector, in the various cooperative business-to-business activities now carried out in industry, which allows for the ready exchange of information about environmentally sound products and

services. If such goods and services are purchased in bulk in a cooperative fashion, product suppliers might work to improve their own environmental activities to assure the opportunity for sales to the field. These companies and their officials should be invited to join the national council.

In summary, there are many hundreds of organizations and research facilities, and thousands of researchers and graduate-level trainees, who could be organized to work on the endeavor.

## Program Suggestions

The committee considered and recommends the following suggestions for research administrators, faculties, and students.

### *Purchasing and administrative services.*

*a)* Incorporate environmental standards in all contracts for goods and services; *b)* purchase only what is needed; *c)* implement an environmentally friendly products purchasing policy, i.e., for products that are durable, reusable, recyclable, made of recycled materials, nonhazardous, energy efficient, produced in an environmentally sound manner, etc; *d)* replace white virgin material paper with 100% postconsumer recycled, nonchlorine bleached paper; and *e)* buy only computers and office equipment compliant with the EPA Energy Star program.

*Energy conservation.* *a)* Create an energy database that documents both energy use and completed energy conservation measures and projects; *b)* develop heating and cooling season temperature policies that promote conservation; *c)* minimize fan and equipment run times; *d)* exploit all cost-effective retrofit opportunities for efficient lighting, heating, ventilation, air conditioning, motors, drives, etc; *e)* for lab buildings, focus on fume hood ventilation system efficiency measures including heat recovery and variable air volume fan systems; *f)* make conservation projects happen by using energy service companies, third-party financing, and utility demand side management incentives; *g)* use life-cycle analysis to evaluate conservation projects; and *h)* organize an ongoing energy awareness program that enlists the support of the campus community and encourages efficient operation of lights, office equipment, etc.

*Water.* *a)* Implement water conservation program to retrofit inefficient plumbing fixtures, reducing water consumption by 25% or more; *b)* avoid water-consuming air compressors and one-pass air-conditioning systems; *c)* protect groundwater and storm runoff by minimizing use of salt for ice melting and by implementing automotive oil recycling program for on-campus students; and *d)* use drought-resistant plantings and minimize irrigation.

*Campus grounds and land use.* *a)* Redefine campus beauty; *b)* naturalize and promote "natural succession" for unneeded lawn areas and reduce grass cutting; *c)* minimize use of lawn herbicides; *d)* develop a natural appreciation program; *e)* protect woodlands, wetlands, watershed, and wildlife; *f)* implement a tree protection policy; and *g)* use integrated pest management techniques to minimize or eliminate use of pesticides and herbicides.

*Transportation.* *a)* Encourage on- and off-campus transit by carpooling, public transportation, bicycling, and walking; and *b)* convert vehicle fleet to alternative fuel, e.g., natural gas.

*New construction.* *a)* Do not oversize or build unnecessarily; *b)* use sustainable or green design principles; *c)* design for state-of-the-art energy efficiency; *d)* exceed energy codes; *e)* incorporate renewable energy technologies including daylighting and passive solar; *f)* include suitable recycling collection space in building design programs; *g)* recycle construction and demolition debris; *h)* specify environmentally friendly building products that are energy efficient to produce, and made with recycled or sustainably harvested materials that do not contain hazardous chemicals; and *i)* evaluate options based on life-cycle analysis.

*Campus planning and design.* *a)* Locate campuses convenient to the population being served and to regional public transit system; *b)* develop campus master plans to minimize negative impacts and disruption of natural ecosystems and surroundings; *c)* preserve and enhance greenspace and protect natural areas from development; *d)* concentrate buildings and arrange campus walkways and roads to minimize on-campus driving and create a convenient pedestrian campus; *e)* allow for solar access in building siting and orientation; *f)* use water-efficient plantings; landscape for energy efficiency as well as aesthetics; and *g)* subject all new building, renovation, and expansion plans to a public participation process, an environmental impact analysis, and sustainable design principles.

*Investment policies.* *a)* establish environmental criteria for financial investments, and *b)* use stockholder influence to encourage environmentally responsible business practices.

*Teaching and research.* *a)* strengthen and prioritize undergraduate, graduate, and postgraduate environmental education, research, and policy programs; *b)* develop programs to train faculty and teach environmental stewardship to all biomedical research students; *c)* expand opportunities for using the campus physical plant and business operations as a learning lab for students; and *d)* develop community environmental education programs and participate in public dialogue on environmental issues.

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## Committee Recommendations

The committee recommends development of a national council for environmental stewardship in biomedical research composed of the many individuals and organizations now involved in research, research and organization funding, sales to or purchases from research entities, and public policy development on environmental stewardship, and development of an education and information service to all engaged in biomedical research, including suppliers of goods and services to the field. The purpose of the council is self-evident by its title; it could be a stand-alone enterprise or affiliated and/or administered by another organization.

Second, the committee recommends development of an information and education program for all those engaged in biomedical research, especially students and graduate fellows who soon will become principal investigators and administer research programs of their own. Work with students already sensitized to environmental concerns should be encouraged. There should be more attention given to science laboratories in K-12 educational facilities, as well as to higher education facilities.

Third, advocacy for best practices in green auditing in biomedical research should be developed and a list of purchasers who have completed such auditing should be made

widely available, including by electronic means. Also included could be evaluation of environmental worth and impact of products and services. Environmental standards should be incorporated in all contracts for goods and services.

Fourth, programs should be developed for sustainable buildings and use for the biomedical research administration field, including renovation, office planning, and case studies.

And last, a clearinghouse/website should be established, following recommendations made in this article and elsewhere in this supplement, to inform the biomedical research enterprise of the availability of information.

## REFERENCES AND NOTES

1. National Center for Education Statistics. Digest of Education Statistics. 1998. The U.S. Department of Education, Office of Educational Research and Improvement, collects, analyzes and disseminates statistics and other data related to education in the United States and in other nations.
2. "Labs 21" Laboratories for the 21st Century is a voluntary initiative to improve laboratory environmental performance that was begun through the Office of Administration and Resource Management of the U.S. Environmental Protection Agency and evolved from the efforts of the agency to improve the environmental performance of its own laboratories. See Fed Reg 65(109):35929–35931 (2000) for additional information.
3. Office of Pollution Prevention and Toxics, U.S. EPA. EPA742—F-99-106. 1999. The Memorandum of Understanding states the mission to be elimination of mercury waste generated by hospitals by 2005; reduction of overall hospital waste volume by 33% by 2005 and 50% by 2010; and joint identification of additional substances to target for pollution prevention and waste reduction opportunities.
4. Building for Environmental and Economic Sustainability is powerful software developed by the National Institute of Standards and Technology and designed to help the construction industry select cost-effective green building products.